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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* TEDDY M. KELLER and  
DAWN D. DOMINGUEZ

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Appeal 2008-2758  
Application 10/808,266  
Technology Center 1700

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Decided: July 9, 2008

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Before BRADLEY R. GARRIS, CHARLES F. WARREN, and  
CATHERINE Q. TIMM, *Administrative Patent Judges*.

TIMM, *Administrative Patent Judge*.

DECISION ON APPEAL

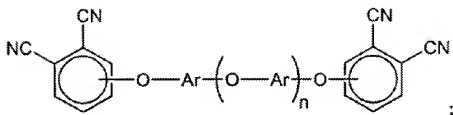
Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 14-21 and 38-56. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm-in-part.

## I. BACKGROUND

The invention relates to thermosets formed from phthalonitrile monomers (claim 14), and processes for preparing such thermosets (claims 38 and 47). Claims 14, 38, and 47 are illustrative:

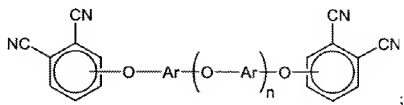
14. A thermoset formed by curing a mixture comprising a phthalonitrile monomer comprising the formula:



wherein Ar is an independently selected divalent aromatic radical with or without substituents containing one or more fused aromatic rings, one or more non-fused aromatic rings without intervening functional groups, or combinations thereof wherein the radical sites are on the same or different aromatic rings; and

wherein n is an even integer greater than or equal to 2.

38. A process of preparing a thermoset comprising the step of curing a mixture comprising a phthalonitrile monomer comprising the formula,



wherein Ar is an independently selected divalent

aromatic radical with or without substituents containing one or more fused aromatic rings, one or more non-fused aromatic rings without intervening functional groups, or combinations thereof wherein the radical sites are on the same or different aromatic rings; and

wherein n is an even integer greater than or equal to 2.

47. A process of preparing a thermoset comprising the steps of:  
reacting a dihydroxyaromatic with a dihaloaromatic;

wherein the reaction is performed in the presence of a copper compound and a base; and

wherein the dihydroxyaromatic is present in an excess amount;

reacting a 3- or 4- nitrophthalonitrile with the product of the previous step; and curing a mixture comprising the product of the previous step.

Two rejections under 35 U.S.C. § 103(a) are presented for our review:

1. the rejection of claims 14-21 and 38-46 as unpatentable over US 4,259,471 issued Mar. 31, 1981 to Keller et al. (Keller '471); and
2. the rejection of claims 47-56 as unpatentable over either US 5,352,760 issued Oct. 4, 1994 to Keller (Keller '760) or US 5,464,926 issued Nov. 7, 1995 to Keller (Keller '926).

In rebuttal, Appellants rely upon

Williams et al., *Solvent-Assisted Ullmann Ether Synthesis. Reaction of Dihydric Phenols*, J. Org. Chem., 32, 2501 (1967).

Hammann et al., *Synthesis of Seven New Polyphenyl Ethers*, J. Chem. and Eng. Data, 15(2), 352 (1970).

Declaration under 37 C.F.R. § 1.132 of Teddy M. Keller.

## II. DISCUSSION

### A. The Rejection of Claims 14-21 and 38-46 over Keller ‘471

Appellants argue some of the rejected claims separately. We address each group as follows.

#### 1. Claims 14 and 38

As stated by Appellants:

Claim 14 is to a thermoset formed by curing a mixture comprising a phthalonitrile monomer  $C_6(CN)_2H_3-O-Ar-(O-Ar)_n-C_6(CN)_2H_3$ . Claim 38 is to the same method of making the thermoset. Keller discloses the structure  $C_6(CN)_2H_3-(O-\phi)_x-O-C_6(CN)_2H_3$ , where x is from 1 to 10.<sup>[1]</sup> Note that when n is 2 in the present claims, x is 3 in Keller. When x is 3, 5, 7, or 9, the disclosed structure is within the scope of the presently claimed structure.

(Br. 3.)<sup>2</sup>

In other words, as acknowledged by Appellants, Keller ‘471 describes phthalonitrile monomers which, when x is 3, 5, 7, or 9, have the structure required by claims 14 and 38.

Appellants contend, however, that Keller ‘471 “is not enabling for all disclosed values of x, including 3, 5, 7, or 9” (Br. 3). Specifically, Appellants contend that Keller ‘471 fails to enable the synthesis of the aromatic diols required for the synthesis of the phthalonitrile monomers (Br. 3). Appellants acknowledge that Keller ‘471 states that the aromatic diols

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<sup>1</sup> Formula member “ $\phi$ ” is phenyl.

<sup>2</sup> References to the Brief are to the Corrected Brief filed June 26, 2007.

“are easily made by an Ullman ether synthesis,” but they contend that the Ullman ether synthesis referred to by Keller ‘471, in declarant Keller’s expert opinion, “cannot be used to make oligomeric or polymeric aryl ethers in high yield and high molecular weight” (Br. 3 referring to the Keller Declaration).

The issue to be resolved is: Have Appellants presented sufficient evidence to show that one of ordinary skill in the art would not be able to synthesize the aromatic diol precursors at the time of the invention?

We answer in the negative.

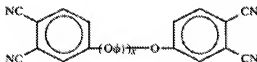
It is well settled that prior art under 35 U.S.C. § 102(b) must be “enabling”, i.e., it “must sufficiently describe the claimed invention to have placed the public in possession of it.” *In re Donohue*, 766 F.2d 531, 533 (Fed. Cir. 1985). “Such possession is effected if one of ordinary skill in the art could have combined the publication’s description of the invention with his own knowledge to make the claimed invention.” *Id.* A reference is presumed to be enabling and therefore, once the examiner establishes that the reference teaches each and every limitation of the claimed invention, the burden shifts to the applicants to prove the reference is not enabling. *Chester v. Miller*, 906 F.2d 1574, 1578 (Fed. Cir. 1990); *In re Sasse*, 629 F.2d 675, 681 (CCPA 1980).

As a first matter, we note that we answered an analogous question in related Appeal No. 2007-0650 (*see* Decision mailed June 27, 2007). That same reasoning applies here. In that case, Appellants made a similar argument against Keller ‘471 relying upon the same evidence Appellants rely upon here. The claim reviewed in that case was somewhat different than the claims under review here. Specifically, the claim under review in

2007-0650 (claim 1) was more broadly directed to polyaromatic ethers with no requirement for the nitrile groups of claims 14 and 38 of this appeal, but narrower in that n was required to be greater than or equal to 7. However, those differences are of little moment with respect to the issue under review. Just as in that case, Keller '471 describes compounds within the scope of the claims and thus the burden was shifted to Appellants to show non-enablement.

As we pointed out in 2007-0650, Keller '471 provides the following guidance on how synthesize the resins:

The resins of the present invention are obtained by heating a bisorthodinitrile of the general formula:



wherein x is an integer from 1 to 10 and the phenyl groups are attached at the meta or para position. The bisorthodinitriles are prepared by a nucleophilic substitution of the nitrosubstituent of 4-nitrophthalonitrile with an aromatic diol. The aromatic diols are easily prepared by an Ullman ether synthesis. Further discussion of this type of synthesis can be found in Williams, A. L. et al. *Solvent-Assisted Ullman Ether Synthesis. Reactions of Dihydric Phenols*. In *Journal of Organic Chemistry* 32: p. 2501-05. August 1967 and in Hammann, W. C. et al. *Synthesis of Seven New Polyphenyl Ethers*. In *Journal of Chem. and Eng. Data* 15(2): p. 352-5. 1970.

(Keller '471, col. 3, l. 56 to col. 4, l. 8).

Here as in the prior case, we cannot say that Appellants have provided sufficient evidence and/or reasoning to support a determination that those of ordinary skill in the art would not have been able to synthesize the aromatic

diols needed to obtain the  $x = 3, 5, 7$ , and 9 phthalonitriles within the scope of Keller's teachings and encompassed by Appellants' claims. As we said in the prior case:

Looking at the issue through the facts of the cases that have construed "possession" in the context of what is enabling, we note that prior art references were found to be non-enabled when there was a complete absence of a known or obvious method of making the product in a stable form. *See In re Brown*, 329 F.2d 1006, 1011, 141 USPQ 245, 249 (CCPA 1964) ("[W]e do not think that Clark's reference to his *unsuccessful attempts* to prepare fluorine-containing silicone homopolymers would place such homopolymers in the possession of the public" (emphasis added)); *In re Sheppard*, 339 F.2d 238, 241-42, 144 USPQ 42, 45 (CCPA 1964) ("Emelus indicates a *complete lack of success* in preparation of pentafluorides" in a stable form (emphasis added)); *In re Hoeksema*, 399 F.2d 269, 274, 158 USPQ 596, 601 (CCPA 1968) ("[T]he *absence* of a known or obvious process for making the claimed compounds overcomes a presumption that the compounds are obvious." (emphasis added)); *In re Collins*, 462 F.2d 538, 542-43, 174 USPQ 333, 337 (CCPA 1972) ("[T]he lack of a teaching in Collins of how to make the presently claimed heat exchangers vitiates the rejection unless there was *some* known or obvious way to make them." (emphasis added)).

Appellants present no convincing evidence that those of ordinary skill in the art at the time of the invention would be unable to make the diols at issue. Keller states that the aromatic diols "are easily prepared by an Ullman ether synthesis" (Keller, col. 3, l. 68 to col. 4, l. 1), and this provides evidence that those of ordinary skill in the art would have understood how to adapt an Ullman ether synthesis method to obtain the desired diols. Keller states that Williams and Hammann "discuss" Ullman ether synthesis. This language provided evidence that this "discussion" would have provided enough guidance to the skilled artisan to allow synthesis of all of the diols of Keller.

We again find the Keller Declaration insufficiently probative of non-enablement. According to the Declaration, “[t]he Ullmann ether synthesis referred to in the Keller reference (US Patent No. 4,259,471) cannot be used to make oligomeric or polymeric aryl ethers *in high yield and high molecular weight*.” (Declaration ¶ 3 (emphasis added)). Enablement does not require synthesis in high yield, only the ability to synthesize. Moreover, what declarant Keller means by “high molecular weight” is not clear. The evidence does not convince us that those of ordinary skill in this art would not have known how to synthesize the aromatic diols of the Keller reference.

Appellants have not satisfied their burden of showing that the Keller reference is not enabling with respect to the subject matter of claims 14 and 38.

## 2. Claim 16

Appellants argue claim 16 separately. Specifically, Appellants contend that the specific values of  $n$  claimed (equal to 2, 4, 6, or 8) are not disclosed by Keller ‘471 (Br. 4). The Examiner responds that  $n = 2, 4, 6$ , and 8 corresponds to  $x = 3, 5, 7$ , and 9. Keller ‘471 discloses that  $x = 1-10$  and includes those values claimed.

Appellants have not convinced us of a reversible error in the Examiner’s rejection of claim 16.

## 3. Claims 20, 21, 40, and 41

Appellants argue claims 20, 21, 40, and 41 as a separate group contending that these claims recite that the polymerization mixture further comprises other phthalonitriles, and that Keller ‘471 does not disclose copolymerizing the disclosed phthalonitrile with other phthalonitriles (Br.

4). The Examiner responds that Keller '471, in fact, does disclose the use of one or more phthalonitriles (bisorthodinitriles) of the general formula in the Abstract (Ans. 6).

We select claim 40 which is dependent on claim 38 and requires that “the mixture comprises more than one phthalonitrile monomer” to represent the issue on appeal.

As pointed out by the Examiner, the Abstract states that “one or more” of the phthalonitrile monomers may be used to produce the resin. Appellants have not convinced us of a reversible error on the part of the Examiner in rejecting claims 20, 21, 40, and 41.

4. Conclusion with respect to claims 14-21 and 38-46

Appellants do not argue any other claim separately, therefore, the other claims stand or fall with claims 14 and 38. As Appellants have not convinced us of a reversible error with respect to the rejection of claims 14-21 and 38-46 over Keller '471, we sustain this rejection.

B. The Rejection of claims 47-56 over Keller '760 or Keller '926

Claims 47-56 require the presence of a copper compound in the step of reacting a dihydroxyaromatic with a dihaloaromatic (the first step), a step that occurs before a second step of further reacting the product of the first step with 3- or 4- nitrophthalonitrile and also before a third step of curing a mixture comprising the product of the second step.

The Examiner acknowledges that neither Keller '760 nor Keller '926 describes including copper in the first step, rather, the Keller references only disclose using copper curing agents in the third step. However, according to the Examiner

it would have been obvious to one of ordinary skill in the art to add the curing agent into the final step of the process, as disclosed in the references, instead of the first step of the process of the instant claims, since they have the same functionality under same steps of the process to form the same products in the absence of a showing of unexpected results derived from [sic] said selection.

(Ans. 5.)

The Examiner also contends that

In claims 47 and related claims, Appellant is correct in stating that the references do not disclose the presence of a copper compound as curing agent in the first step, when reacting a dihydroxyaromatic with a dihaloaromatic. However, the curing step occurs after reacting the product of the first step with a nitrophthalonitrile. It indicates that the copper does not have any functionality in the first step.

The references do disclose the presence of a curing agent and its functionality in the final step of the process, to cure the product of the first step with a nitrophthalonitrile, as in the claims.

(Ans. 6.)

We cannot say that the above analysis has the necessary rational underpinning to support a conclusion that it would have been obvious to include a copper compound in the first step of claim 47. *See In re Kahn*, 441 F.3d 977, 985-88 (Fed. Cir. 2006) (“there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.”).

We do not sustain the rejection of claims 47-56 as unpatentable over Keller ‘760 or Keller ‘926.

### III. CONCLUSION

In summary, we sustain the rejection of claims 14-21 and 38-46 under 35 U.S.C. § 103(a) as unpatentable over Keller ‘471, but do not sustain the rejection of claims 47-56 under 35 U.S.C. § 103(a) over Keller ‘760 or Keller ‘926.

### IV. DECISION

The decision of the Examiner is affirmed-in-part.

### V. TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal maybe extended under 37 C.F.R. § 1.136(a)(1)(iv).

### AFFIRMED-IN-PART

tf/lis

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